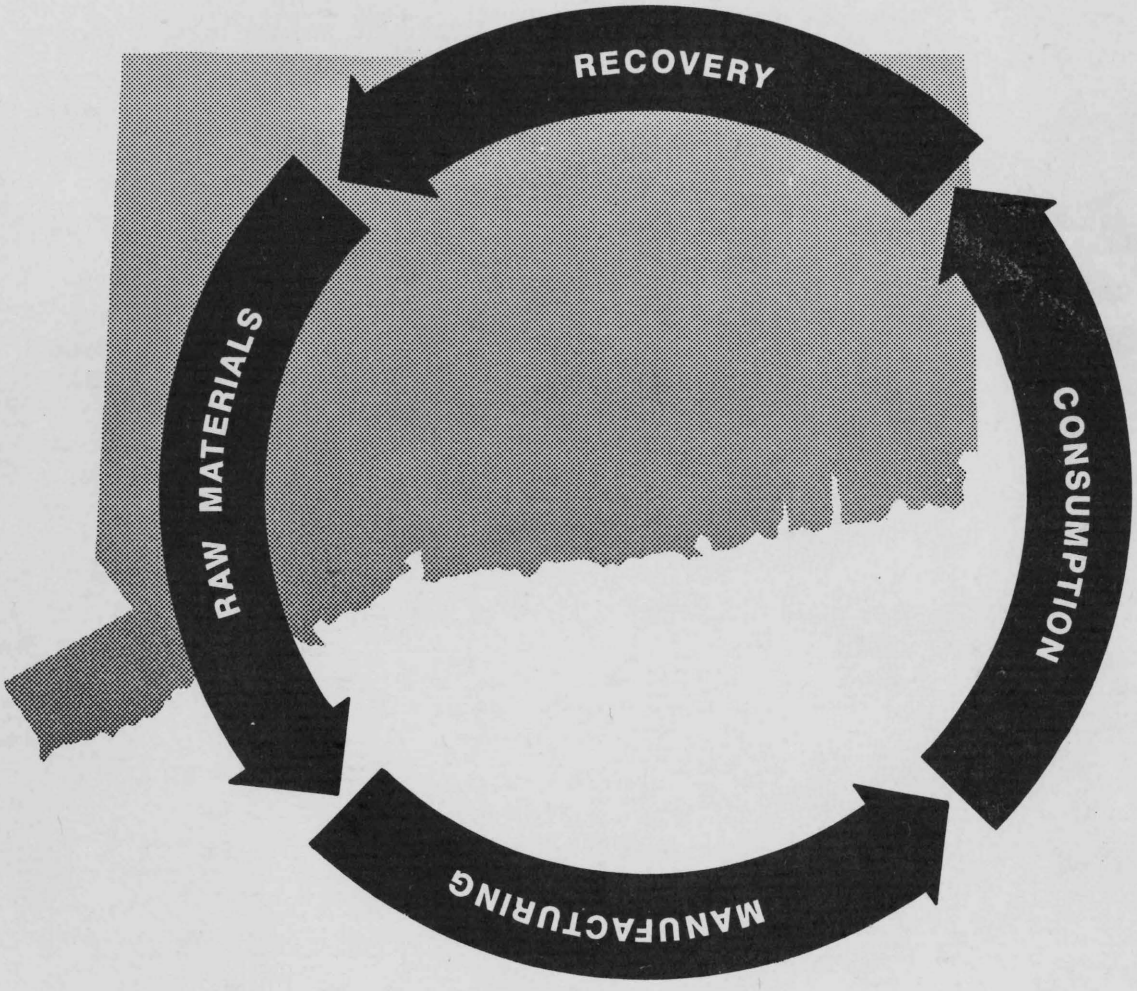
MEETING THE SOLID WASTE CRISIS

THROUGH RESOURCES RECOVERY



State of Connecticut
Department of Environmental Protection

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

March, 1973

OFFICE OF
COMMISSIONER
DAN W. LUFKIN

TO THE CITIZENS OF CONNECTICUT:

The people of the State of Connecticut, working through their State and local governments have an important opportunity to do something that is both exciting and realistic in the management of the refuse we discard day after day.

Connecticut's solid waste disposal problems are severe. Our present methods, for the most part, degrade our environment and waste valuable, finite resources. We need a new approach that is environmentally sound, socially acceptable and economically practical. We need to use technological skills and management know-how to develop this approach and make it work. And, we need to know the feelings of the people of the State of Connecticut about how they want to see this problem handled.

A recent article in the New York Times quoted a New York State study as saying: "The public doesn't care -- it is apathetic about solid waste practices and their effect on the environment." I don't believe this is true in Connecticut. I believe the people of Connecticut do care.

That is why we are sending out this progress report. It tells you what we are thinking -- what the basic concept might be for a system of waste disposal with resource recovery and the most practical method for achieving implementation.

We need to know what you think. There's a page at the end of this booklet that you can use to tell us. Please send it in as soon as you can. Thank you for helping us better serve you.

At your service,

Dan Lufkin

Dan W. Lufkin

DWL:jbo

INTRODUCTION

Connecticut today faces a solid waste crisis. Every day the State's three million people discard more than 10,000 tons of refuse . . . and the amount is constantly increasing.

Many of the State's landfills are now filled to near capacity. Many of these landfills represent a threat to water quality. Most of Connecticut's incinerators do not comply with Federal and State air pollution standards. And we reclaim very little of the resources contained in our refuse.

In 1971, the State's elected officials recognized the severity of the solid waste problem and began to deal with it. In that year, the General Assembly passed, and Governor Thomas J. Meskill signed, a bill which gave the Department of Environmental Protection responsibility for developing a statewide solid waste management plan by the summer of this year, 1973.

In an effort to enlist the management and technical skills of private enterprise, the Department sought to create an industry-government partnership to tackle the problem. The State invited leading companies to submit competitive proposals for designing a system which would meet Connecticut's solid waste management policy of maximum resources recovery with minimum environmental degradation at the lowest possible cost.

The General Electric Company was chosen from more than 20 companies that submitted proposals, because General Electric demonstrated that it could best meet the State's system-design goals. A supporting factor was that General Electric did not have a line of solid waste disposal hardware for sale and could therefore be totally objective in working with the State on the system design portion of the program.

Resources recovery was considered as a priority goal of the system from both economic and environmental standpoints. Today, only a fraction of the annual refuse tonnage is reclaimed — and yet the State's solid waste contains valuable raw materials that manufacturers could utilize to produce their products.

Resources can be recovered by separating waste components (paper, glass, metals) in the home before collection or by separating the components in centralized processing plants after collection. Separating newsprint, cans, and glass at the home would allow approximately 25 percent of the total residential waste to be recycled directly. For the most part, source separation has been carried out on a voluntary basis, but some towns are now looking into legislation requiring homeowners to separate their refuse.

The Department of Environmental Protection strongly supports source separation and anticipates that it will play an important role in solving the State's solid waste problem.

This preliminary report is oriented toward resources recovery through centralized processing, not because source separation is unimportant, but because the study team must propose a system to handle all of the State's solid waste for the foreseeable future. Even if source separation were implemented, centralized processing would be required for the 75 percent of the waste stream not composed of newspapers, cans, and bottles.

This publication is printed on 100% recycled paper.

A PRELIMINARY LOOK

General Electric is now halfway through the one-year design study. A general outline of how the system may look is beginning to emerge. There is much work yet to be done but, at this time, it is possible to examine in some detail one of the several alternatives being considered by the Department of Environmental Protection/General Electric team.

This alternative is described briefly on the following pages. It can only be considered a "first-cut" description of one option being explored, but it gives us an indication of how the statewide system **may** look.

The starting point is Connecticut **today,** with **no** State or municipal facilities to separate and sort refuse, **no** plants to recover valuable resource components, and **no** facilities to recover the stored energy of burnable waste — to say nothing of solving the overall problems of environmental degradation, improper land use, and spiraling costs.

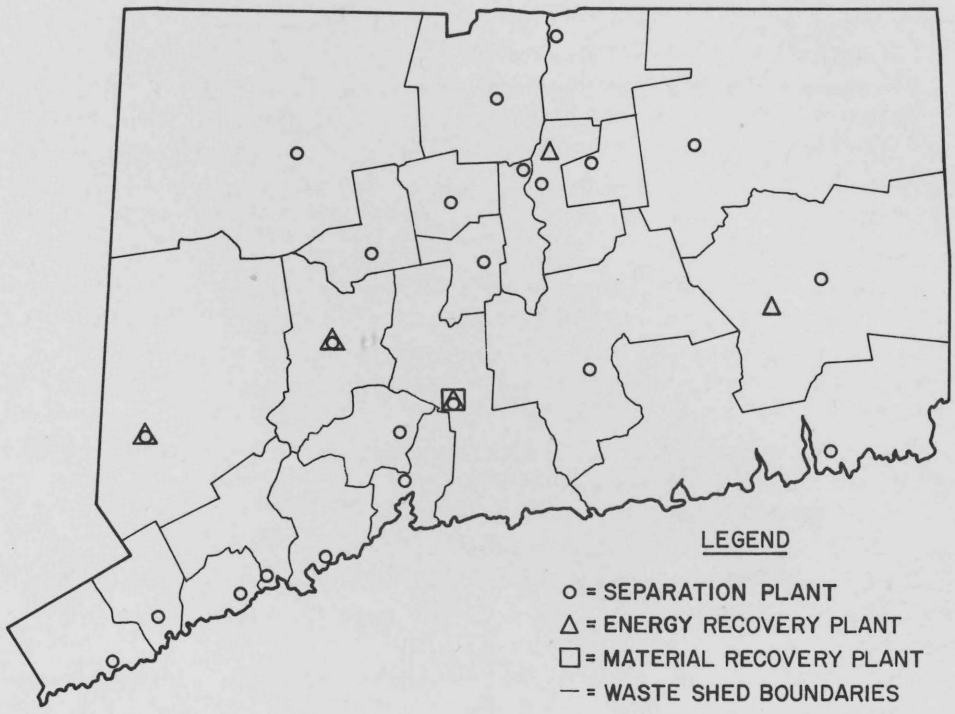


Figure 1. Goal: Connecticut Resources Recovery System in the Year 2000.

The analysis progresses to describe Connecticut's needs to the year 2000 and depicts a statewide system that could include as many as 23 waste separation plants, one large materials recovery plant, and five energy recovery plants — with corresponding environmental and economic benefits. See Figures 1 and 2 for key design elements in this picture.

Above all, the system outlined briefly on the following pages is characterized by flexibility. The system would be able to adapt to change. If predictions for waste loads and the demand for facilities and services prove to be low or high, the system can be adjusted by changing the number and balance of uniform facilities. Similarly, if the waste characteristics change, the system can be adjusted by making relatively minor changes in the types of processing equipment. The preliminary system design appears to be one sound way of handling the State's solid waste disposal problems at reasonable cost for the foreseeable future. Of course, over the next six months, the Department of Environmental Protection/General Electric team will continue to test and evaluate this approach and to examine all possible approaches so State policy makers will have an adequate basis for their eventual decision on the system to be used.

The goal remains to convert as much refuse as possible into usable commodities, with the least adverse impact on the environment and with maximum economic benefits to the State and its people in terms of industrial development and jobs, at the lowest cost to the citizen.

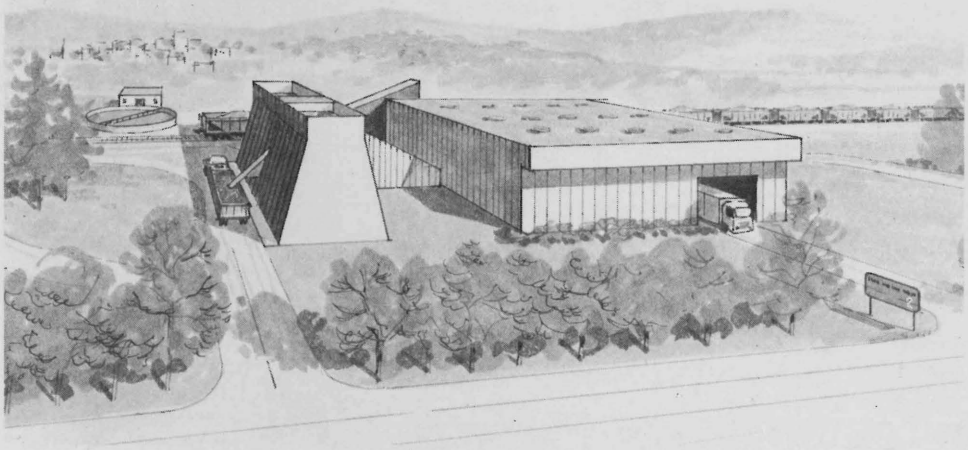


Figure 2. Artist's Conception: Solid Waste Separation Plant

FROM REFUSE TO REUSE: KEEPING UP WITH THE JONES'S GARBAGE

We want to take a look at how the system would handle one family's weekly garbage output. Before doing this, let's see how "residential" waste is handled today.

A typical family of four — call them the Jones family — now produces an average of 65 pounds of garbage and trash per week. If the Jones family lives in a suburban or rural area of the State, they may use the family car to carry their garbage and refuse to a dump or a landfill, or they may have it hauled there by truck. At a properly maintained landfill the garbage is spread out, crushed, and covered with six inches of fill at the end of each working day.

But refuse disposed of in most of our dumps and many of our landfills is left uncovered, becoming food for rats and a source of noxious odors. And this is only one aspect of the problem. The most serious hazard posed by dumps and poorly maintained landfills is that the decomposing garbage produces toxic "Leachates" that percolate into underground water supplies or find their way into streams and rivers. These leachates can damage actual or potential water supplies for household or recreational use.

If the Jones family lives in an urban area of the State, their 65 pounds of solid waste are probably picked up by private or municipal trucks, carted to an incinerator, and burned. The unburned residue must then be buried in a landfill.

Even if the incinerator handling the Jones family's solid waste meets State and Federal air pollution standards — and few of Connecticut's 21 incinerators do — incinerating the refuse will still produce noxious gases, flyash, and incinerator residue. Obviously, incinerators that do not comply with air pollution regulations are worse polluters than the few that do. Once in the air, the flyash and gases become not only a visible source of pollution but a public health problem as well.

Unfortunately, most incinerators are located in the highly developed, densely populated areas of the State which suffer the worst air pollution problems. These facilities must either be upgraded, or totally rebuilt, at substantial cost, and soon—or they could be retired as the statewide solid waste management system is implemented.

No matter where the Jones live, little, if any, of the resources value of their wastes will be recovered unless they voluntarily separate some of their wastes and transport cans, bottles, and newspapers to a local recycling center. Even if the Jones family participates actively in local recycling drives, no energy would be recovered from the combustible (burnable) portion of their garbage and refuse, and their overall percentage of recovery would be no more than 25 percent. Voluntary recycling is an important citizen contribution to the solid waste problem, but it will not, in itself, solve the problem.

That's the waste management and resources recovery picture for most of Connecticut in 1973.

Now, let's take a look at how the Jones family's garbage could be handled according to the option we are discussing. If we arbitrarily choose the year 1985 as a base, the Jones family's weekly refuse output would be 85 pounds, according to current estimates of per capita solid waste growth.

Their garbage and trash would be transported to a "separation plant" instead of a landfill or incinerator. At the plant, the Jone's waste, along with that of their neighbors, could be classified, sorted, and reduced to chunks of manageable size by a series of special processing machines.

The result is that the Jones family's 85 pounds of garbage would be separated into:

- Approximately 60 pounds of combustible materials that could be used as supplementary fuel in a utility boiler or converted to fuel oil or natural gas through a process known as pyrolysis.
- Twenty five pounds of noncombustible materials that could be shipped by rail to a materials reclamation plant and be sorted for further processing or resale by Connecticut's secondary material handlers into approximately 8 pounds of glass, 7 pounds of iron, ½ pound of aluminum, ½ pound of other nonferrous metals, and 9 pounds of inert residue.

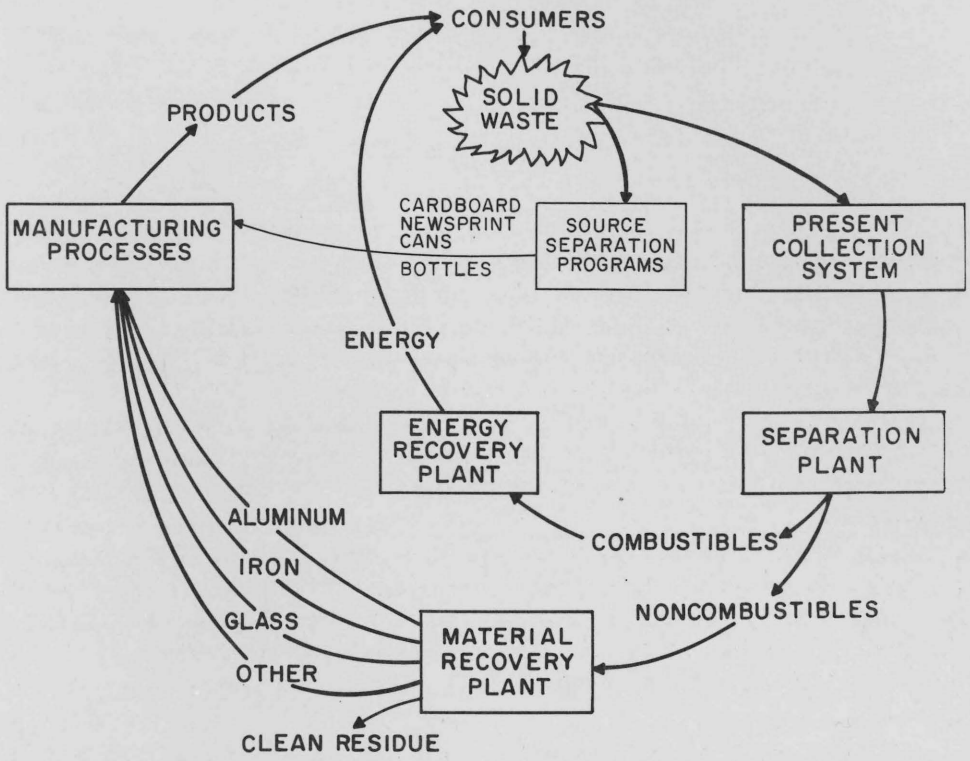


Figure 3. Material Flow

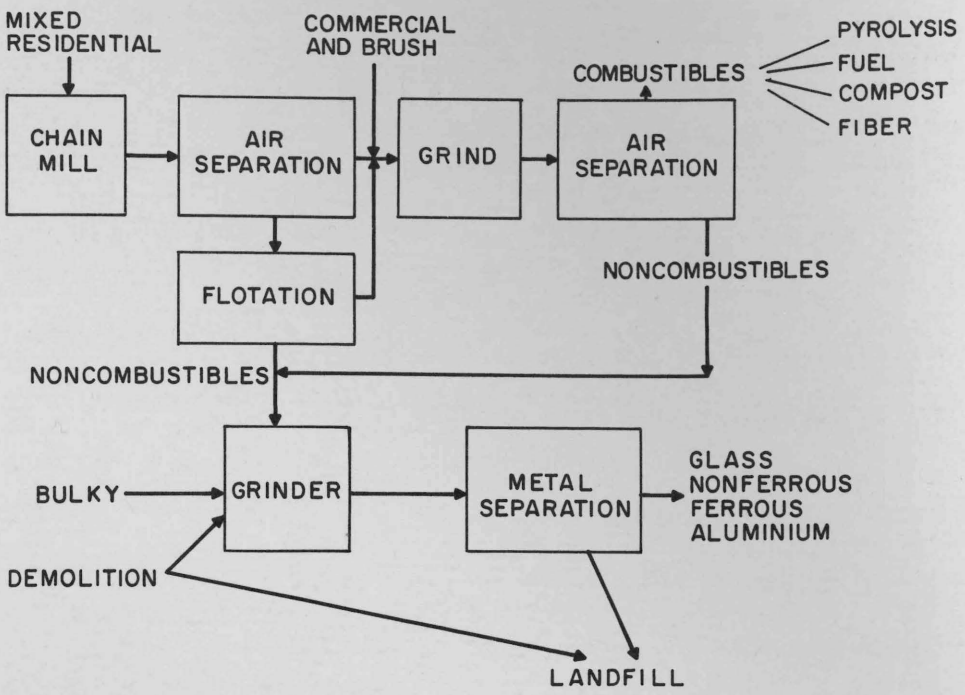


Figure 4. Separation Plant Schematic Diagram

So, the Jones family's 85 pounds of solid waste has been transformed by the system into either steam, oil, or gas and "raw materials" for manufacturing processes. The inert or "clean" residue will have gone to approved landfills to reclaim otherwise useless land. (See Figure 3 for diagram of the total material flow.) The primary processing model suggested for separation plants (See Figure 4) uses existing techniques, basically from the mining industry, to extract energy and material values from this "urban ore." Regardless of the mix of hardware finally installed, one thing is certain — valuable solid waste resources would be recovered, not buried or burned, and costs would ultimately be lowered.

Fuels produced might be sold to utilities and used in the generation of electricity. Or, they could be used for other industrial purposes. The glass could be sold and manufactured into bottles ("ecoglass") or construction materials. The metals could be sold to secondary material handlers — or possibly to new industries that might be attracted to the State by a new, reliable source of raw materials.

And, the system would provide an environmentally sound way of converting the Jones family's unwanted refuse into salable commodities at a cost minimized by large-scale operations and revenue from the sale of the commodities.

THE STATEWIDE SYSTEM — 1985

Now that we have seen how one family's refuse could be handled by the system in 1985, let's step back and look at how the total system might appear by that date, if separation plants were built at an average rate of about one per year.

By 1985, the system would be processing most of the State's mixed municipal and commercial refuse into salable commodities to be marketed back into the economy, disposing of the wastes effectively, and minimizing the need for landfills.

By that year, about 120 of the State's 169 municipalities would be grouped into 13 "waste sheds." A "waste shed" is formed when a group of towns agrees to channel their wastes into a central separation plant, sited to yield the maximum overall efficiency of operation at the minimum transportation cost, whether highway or rail.

A group of separation plants would form an "energy shed," channeling their combustible materials to a properly located energy recovery facility. Such a facility might be a utility boiler that would use combustibles as a fuel supplement, or a high-temperature "pyrolysis" unit that would heat the combustibles in the absence of oxygen to produce oil or synthetic gas.

The noncombustible output from the separation plants could be channeled to a single centrally located materials reclamation plant that would separate glass from metals and further sort the metals into iron, aluminum, and others. This way, the whole State could eventually become a single "materials recovery shed."

By 1985, the system would need fewer landfills than we have today, because far more resources would be recovered. As a result, many of the marginal landfills now in existence could be retired and the land reclaimed. Most landfills that would be in use in 1985 would receive only clean, inert fill, such as materials from demolished buildings and residue from separation plants. Separation plant residue would be only a small percentage of the total waste processed. Since it is inert, the residue would be suitable for land reclamation projects — such as filling scars in the earth's crust left by quarrying operations.

The system described for 1985 is based on the assumption that facilities are built at an average rate of one per year. If towns are scheduled to be included in a "waste shed" at a later date but want a separation plant earlier, and they have a sufficient amount of solid waste to make a unit feasible, the system could be expanded more rapidly. In turn, if Federal legislation requires more stringent controls over solid waste by the States, the system has the built-in flexibility to accommodate such increased regulation. Figures 5, 6, and 7 show how the State would look if the model were extended to the whole State by the year 2000.

This overall flexibility will be built into the system, because it will be designed around a core unit or "module" of approximately 300 to 500 tons per day. When a region generates sufficient waste to make a basic separation plant economical, the plant is built. As population and waste increase, modules are added to the basic plant to accommodate the growth.

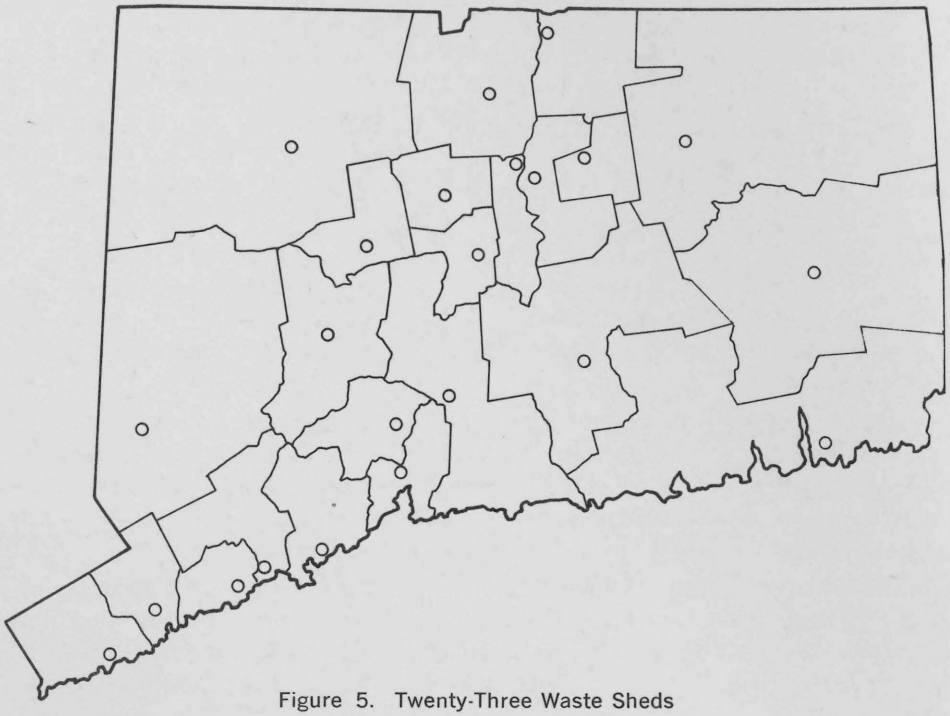


Figure 5. Twenty-Three Waste Sheds

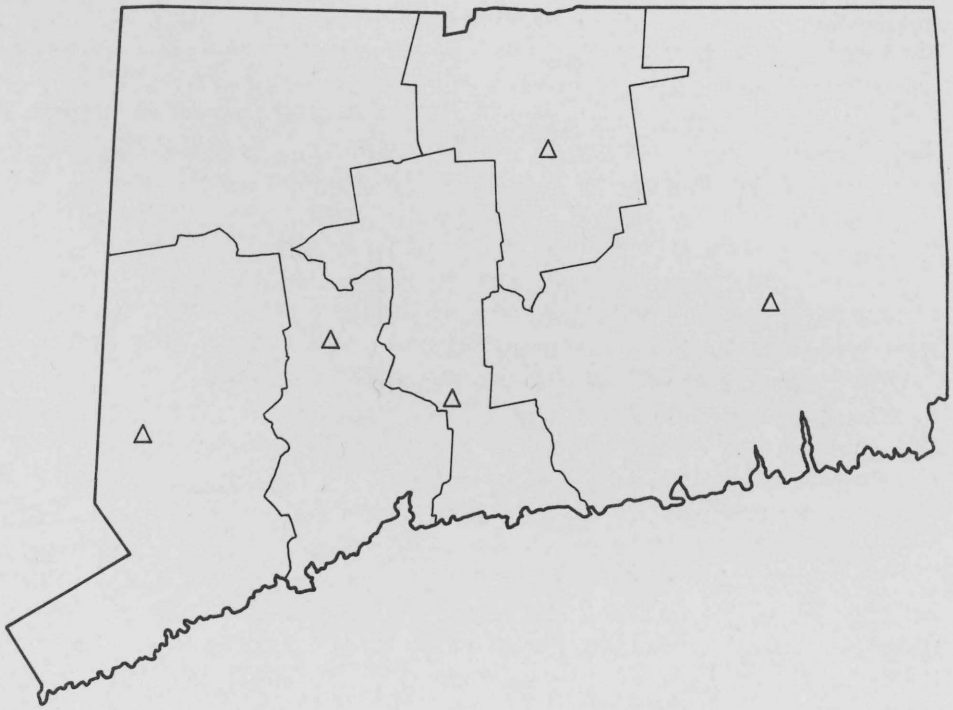


Figure 6. Five Energy Recovery Sheds

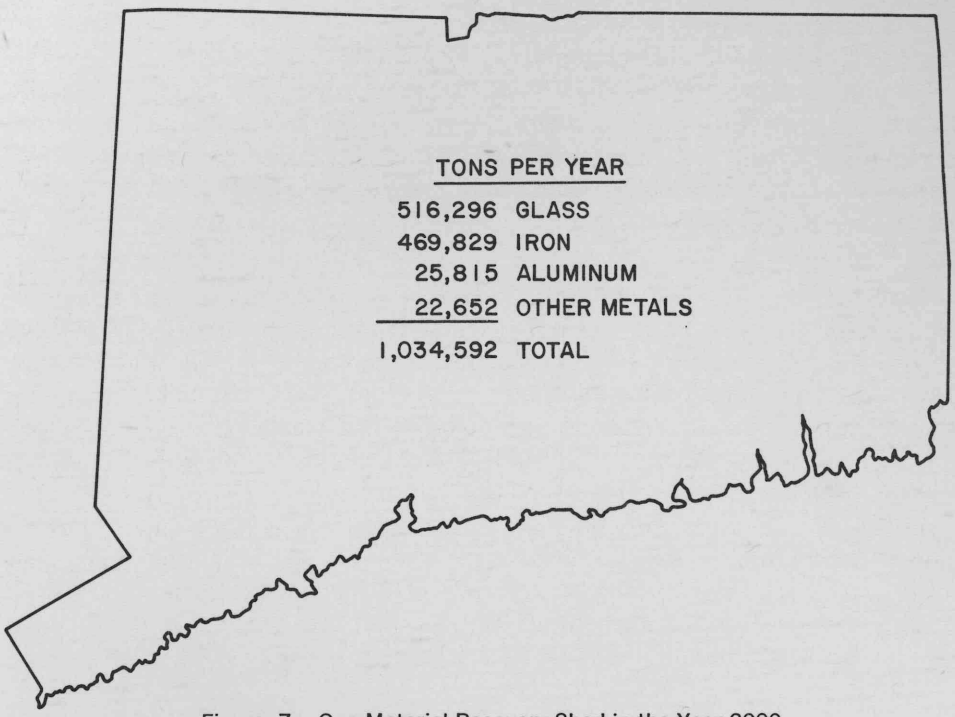


Figure 7. One Material Recovery Shed in the Year 2000.

Some towns in the rural areas may want to continue using landfills. If so, the State would help engineer the sites to eliminate leachate, pollution, rats, and odors and assist in all other ways possible.

The description of the system model should make it obvious that there is no "magic black box" that will instantly eliminate the State's solid waste. Although the solid waste system model presents many advantages, a substantial effort from citizens, local and State governments, and private industry will be needed to implement it. Such a system of waste management and resources recovery would protect the environment and provide economic benefits to the people of Connecticut.

ADVANTAGES OF THE SYSTEM

The advantages of the system are threefold:

- Environmental Improvement
- Resources Recovery
- Economic Benefits

Let's examine how the model could provide these benefits.

ENVIRONMENTAL IMPROVEMENT. Air quality would be improved because existing conventional incinerators could be phased out over a period of time, and the need to build more incinerators would be eliminated. By phasing out the incinerators, the amount of pollutants escaping into the air would be cut by thousands of tons a year, relieving our urban areas, particlarly, of one of their worst air pollution problems.

Water quality would be improved by retiring dumps and landfills which now produce the leachate which impairs the quality of our waters.

The consumption of land by disposal sites would eventually be reduced by hundreds of acres because of a cutback in disposal requirements. Moreover, inert residue produced by the system would provide a clean fill for the reclamation of old quarries and other useless and unattractive land areas that currently need rehabilitation for public use.

RESOURCES RECOVERY. We are not now using the full resource value of solid wastes. The system model would foster the recovery of up to 80 percent of the energy and material values in the ordinary solid wastes that are now flowing into our municipal landfills and incinerators. The potential of the system is such that, through pyrolysis, for example, we could convert our combustibles into millions of barrels of oil per year by the year 2000, not an insignificant amount relative to today's fuel shortages.

Resources recovery through the system model would not be incompatible with voluntary source separation of such materials as newsprint, cans, and bottles. Where local recycling groups are active and wish to continue their activities — and the Department would hope that they would continue — the new system would handle those materials not recovered by such efforts.

ECONOMIC BENEFITS. The State and its taxpayers would benefit from the economies inherent in a large-scale statewide operation. Materials that are not worth processing in small quantities become worthwhile when they are accumulated in large quantities. Also, individuals end up paying less for proper disposal, since the costs of buildings and equipment in the system model would be spread over a large number of system users. Significant savings are also possible in overall capital and operating costs.

Preliminary cost studies indicate that the total capital cost of 13 large material and energy recovery facilities, sufficient to process all of the State's 1985 waste into energy and materials for sale, would cost about $209 million in 1972 dollars. By comparison, an analysis of the new facilities which had been planned prior to the system study indicated that the regions would have spent about $340 million for new facilities in the State. Most of this $340 million would have gone for new incinerators and landfills having almost no resources recovery.

Preliminary figures on the cost of operating the system model show a potential reduction of up to 25 percent, when compared with the cost of operating the landfills and incinerators that have been envisioned in existing regional plans covering the State. The lower operating costs would result from economies of scale, less overlap in services, and revenue from the sale of recovered materials and energy.

Figures now available for one of the State's most serious waste disposal problem areas show that a conventional incinerator-landfill solution for towns in the area would cost approximately 50 percent more than what the model system would cost and would yield almost none of the resources recovery benefits.

Because of its lower costs, the Department of Environmental Protection/ General Electric system model could be economically self-sufficient through user fees and sales of materials and fuel and could require no State subsidy, except possibly for some start-up costs as the new system is phased in. Savings would be passed along to the towns in the form of lower user costs, and, in turn, the towns would have no capital costs for the installation of the processing equipment.

PHASING IN THE SYSTEM

If the system model or a similar concept is adopted, work could begin immediately on the design and construction of the first separation plants and the materials recovery plant. These would serve those areas with the most acute and immediate need. Preliminary design of a prototype separation plant using existing technology is now underway, and the first plant could be in operation within two to three years.

By 1977, one or more pyrolysis plants could be built to convert combustibles to oil or gas, if the economics of such a facility prove to be attractive. (Oil pyrolysis plants capable of processing 200 tons of combustibles per day are being designed for construction in San Diego and Japan, and full-scale gas pyrolysis plants are being designed by the Union Carbide Corporation and the Monsanto Company.)

Initially, there may also be an opportunity to process combustibles into a fuel for use in electric utility boilers. But even at the worst, if it is necessary to landfill the combustibles for a short transition period, separation plant processing would reduce the overall volume of the wastes about as much as conventional incineration methods do, because the separation facilities would size-reduce the bulky items that incinerators generally do not handle.

The speed with which the system could be brought into operation would depend largely on how rapidly the towns and cities want help with their problems. If desired, the total system could be in operation by the mid 1980's.

Until the new separation plants are operational, the model assumes continued use of existing local landfills, and, in some instances, existing local incinerators. However, the most evironmentally damaging sites now in use would be phased out. Some new, short-term local or regional landfills may have to be opened by towns, or agreements may have to be made by towns to utilize existing landfills on a regional basis. The Department and the State would assist in every way possible to accommodate these interim needs.

The State would continue to aid towns that need assistance by providing technical help and funds under Public Act 845 and under the Bureau of Outdoor Recreation program that pays some of the costs for short-term landfills if they are converted to recreational use. The Department of Environmental Protection recognizes the difficulty of enforcing compliance without offering help and has determined that continued funding under Public Act 845 and the Bureau of Outdoor Recreation program is desirable to help alleviate short-term problems faced by towns while they are phasing into the system solution.

THE NEED FOR A PUBLIC SERVICE CORPORATION

The system model just described, or any similar program, will only be as good as the tools that allow for its implementation.

A key consideration in the development of the Connecticut Solid Waste Management program is the question of administration. Which of the many possibilities will provide the citizens of Connecticut with the most efficient management of the system, the most equitable approach for the majority of the State, and will assure the most environmentally acceptable system over the long term?

After examining the alternatives, the Department of Environmental Protection recommends that a public service corporation, in the form of a solid waste authority, be established with the power to issue bonds to cover the major capital costs of a comprehensive statewide solid waste disposal plan, to contract with private suppliers and service corporations, and to set rates and implement the overall statewide operation.

Governed by a board of directors appointed by the Governor, such a public service corporation would be free to move swiftly forward with the design and construction of facilities and the implementation of the overall program.

The benefits of a public service corporation are:

- Financing independent of and apart from State bonding and State debt, thus impacting only minimally, if at all, on overall State credit.
- The capability to be self-sustaining and continuing apart from the necessary vagaries of State budgeting, thus allowing for long-term contracting to take place.
- Separation of the operational aspects of running the solid waste program from the regulatory aspects. The Department of Environmental Protection will ensure that the Authority operates within the standards and regulations established for managing solid waste.
- An operation sensitive to the needs of its customers and directly responsible to its customers for its fee (user charge) income.
- The ability to design, construct, own, and operate the system through contracts with private industry, thus taking advantage of the competition within industry as well as special skills and efficiencies developed by private industry.
- As a statewide operation, the Authority will be able to assure adequate quantities of recovered and reprocessed materials to markets within and outside the State.
- The ability to develop markets and incentives for new and old industries, to make salable products out of recovered resources, and/or to contract with secondary material handlers.

We would like to hear your reaction to the system and the solid waste authority proposed by the Department of Environmental Protection. The self-addressed questionnaire on the next page provides a convenient method to let us know what you think. Thank you for helping us better serve you.

SOLID WASTE MANAGEMENT QUESTIONNAIRE

Please fill out and mail

NAME: _____

ADDRESS: _____

TELEPHONE: _____

POSITION OR AFFILIATION: _____

FOLD

1. What was your overall reaction to the new system described above?

   ☐ Extremely-favorable ☐ Favorable ☐ Neutral ☐ Unfavorable ☐ Extremely-unfavorable

2. Do you feel the authority is a desirable way to implement the new system? Yes_____ No_____

3. What is the feature you like best about the new system?

   Increased resource recovery_____

   Less environmental impact_____

   Lower cost_____

   Other_____

TEAR HERE

4. What major questions, if any, do you feel are unanswered about the new system?

   _____

   _____

   _____

5. What problems or concerns do you have with the new system or the authority? What changes would you like to see made?

FOLD

   _____

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   _____

6. REMARKS: _____

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